Monitoring and Assessment Update-7-7-05

III A. Commercial Lobster Sea Sampling in Massachusetts Bay

MarineFisheries continued commercial lobster sea sampling in order to evaluate potential impacts from pipeline construction to the Massachusetts Bay lobster fishery. This is a cooperative effort with commercial lobstermen and is conducted twice per month during May-November when over 90% of commercial lobster landings occur.

The marketable catch in number of lobster per trap, 1999-2004, standardized to 3 set-over-days (CTH'_3; Estrella and McKiernan 1989) was calculated by month (May-November) during 1999-2004 for the Massachusetts Bay areas of Beverly-Salem and Boston Harbor (Figure IIIA.1). Annual CTH'3 for the two areas are displayed in Figure IIIA.2. These trends will be updated and monitored during the HubLine study period.

Figure IIIA.1. May-November CTH'3 by year (1999-2004) for American lobster from from the Beverly-Salem and Boston Harbor areas of Massachusetts Bay.

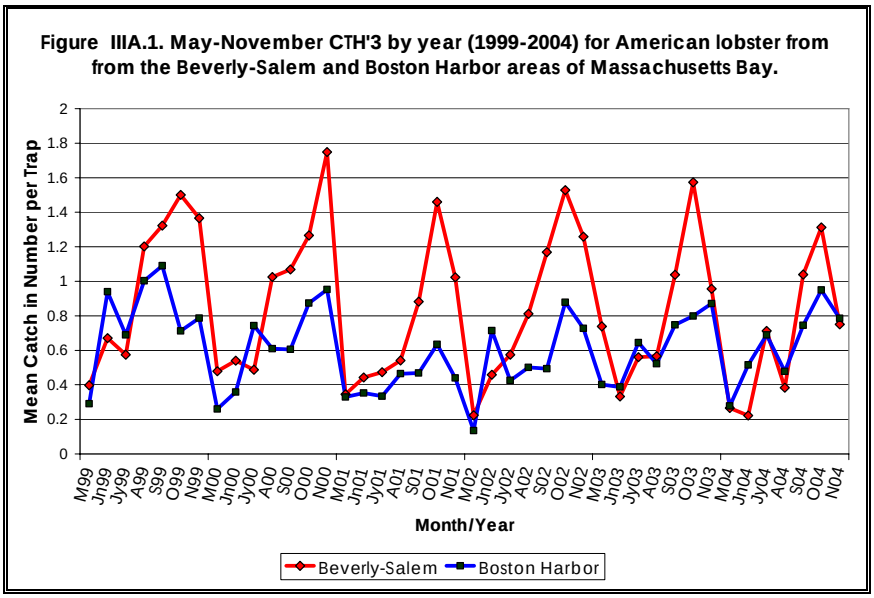
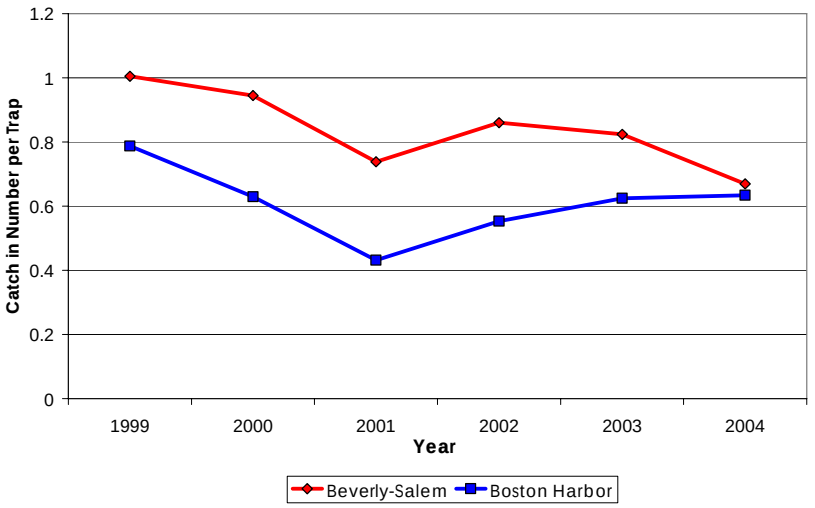


Figure IIIA.2. CTH'3 by year for American lobster from the Beverly-Salem and Boston Harbor areas of Massachusetts Bay, 1999-2004.



III B. Suction Sampling of Early Benthic Phase Lobsters

Suction sampling of early benthic phase (EBP) lobsters was conducted in the Massachusetts Bay area to help evaluate larval lobster settlement relative to previous years (Figure IIIB.1). Sampling was conducted using a diver-operated suction device. Sampling design and equipment was standardized according to the strategy defined by Wahle (1993). The suction device consisted of a 3" PVC lift tube supplied with air from a SCUBA tank. Samples were air-lifted into a 1.5 mm mesh nylon bag attached to the upper end of the suction tube. At each site, 0.5 m^2 quadrats were haphazardly placed on the substratum at least 2 m apart. Large boulders and large patches of sand were avoided. Sampling a quadrat in cobble habitat involved slowly moving the lift tube over the bottom while carefully moving rocks individually (Figure IIIB.2). Rocks were removed until no interstitial spaces remained.

Experimental EBP sampling by diver operated suction equipment in MA coastal waters began in 1995. Due to the short length of the time series, indices have yet to be related directly to commercial catch rates or landings. The effects of natural mortality occurring between settlement and recruitment to commercial size are unclear, making it difficult to interpret trends and their effect on the fishery.

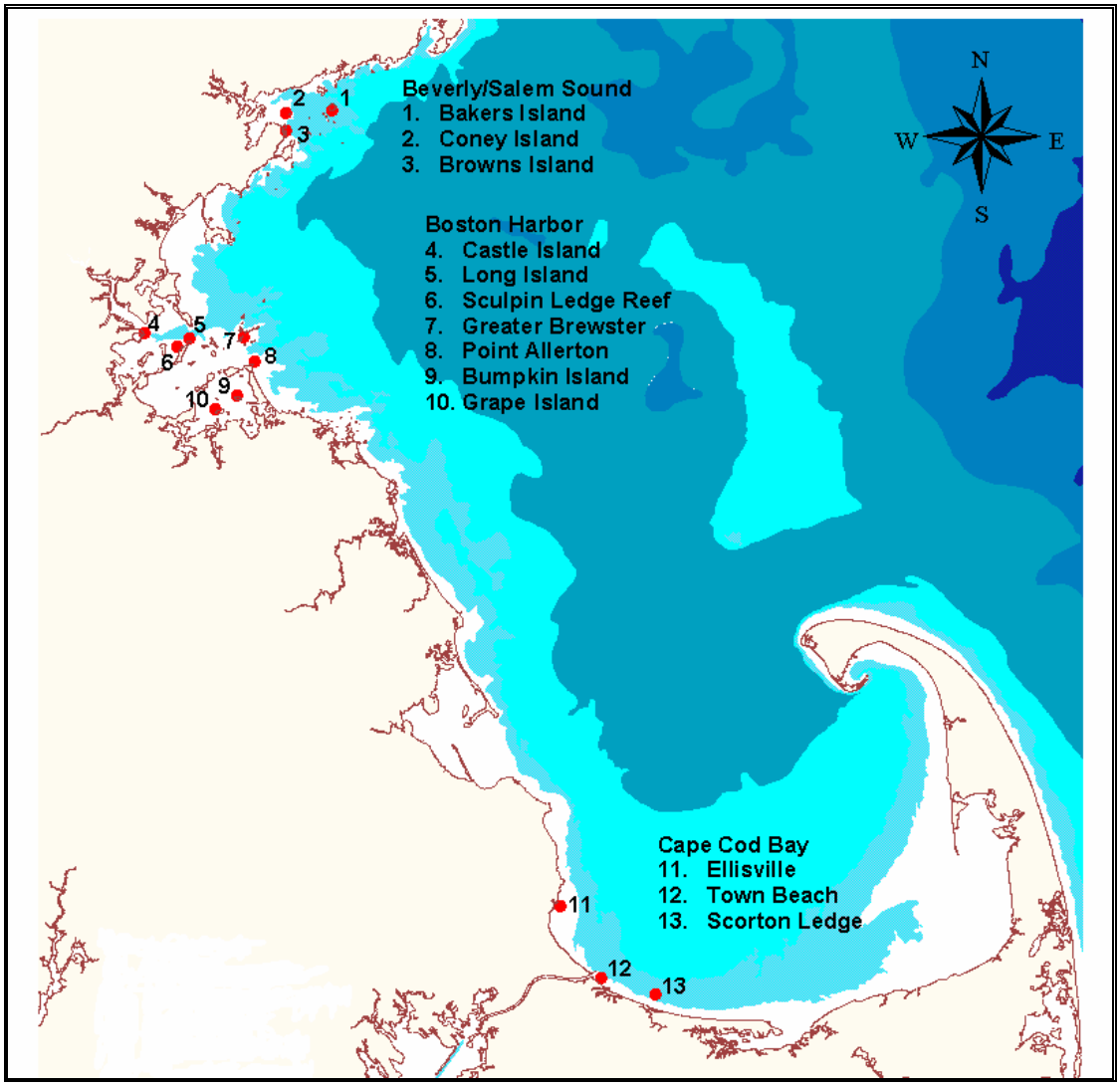
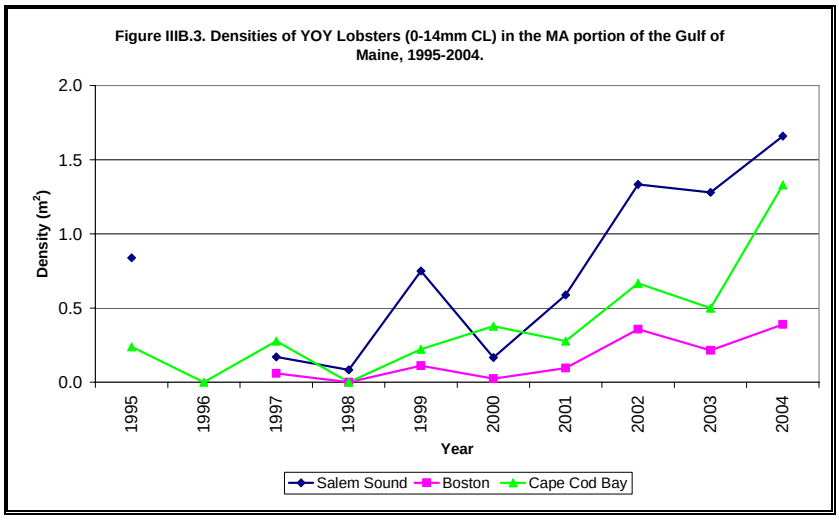


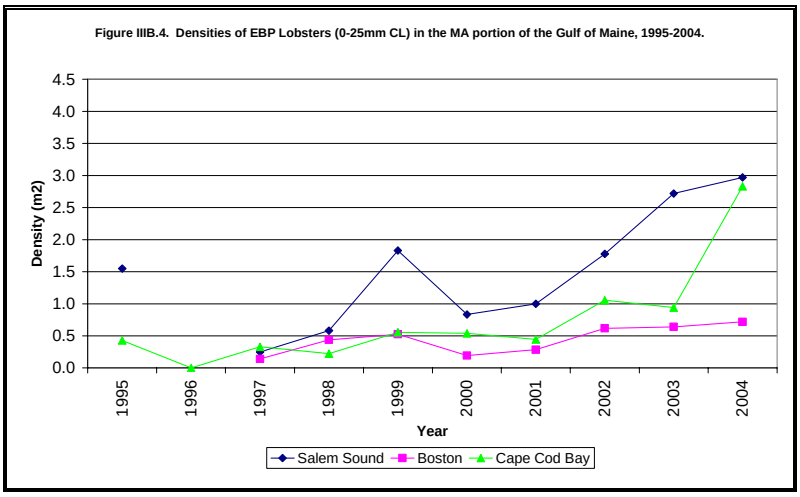
Figure IIIB.1. Suction sampling sites occupied in Massachusetts coastal waters north of Cape Cod, 2004.

Figure IIIB.2. View of typical SCUBA suctioning operation within a 1/2 m^2 quadrat.

The 2003 densities of young-of-the-year (YOY) lobsters (<14mm CL) from regions in the vicinity of the HubLine construction, i.e., Salem Sound, Boston Harbor, and Cape Cod Bay, fluctuated upward from 2003 to 2004 in all three areas (Figure IIIB.3). These are post-larval lobsters which recently settled out of the pelagic stage to the bottom-dwelling stage. The densities of early benthic phase lobsters (0-25mm CL) increased in all three areas (Figure IIIB.4). This group includes YOY sizes through 25 mm CL at which juveniles tends to become mobile and seek alternative shelter. Interpretation of both sets of these data should be done cautiously since they are characterized by high variances.

These time series will be updated annually for the duration of the HubLine Program and augmented with site-specific suctioning of impacted sediments on the pipeline pathway. These additional studies will be undertaken as part of mitigation projects which are being initiated during FY-05.





III C. Ventless Trap Survey

In the fall of 2004 *MarineFisheries* initiated a pilot randomly stratified ventless trap survey for American lobster in Massachusetts Bay. This survey was stratified by depth and sediment type to account for their effects on lobster spatial distribution. The survey is therefore designed to monitor lobster relative abundance and size distribution over a variety of habitats. This knowledge will allow us to quantify the lobster resource in the vicinity of future marine construction projects and therefore help us to evaluate impacts to the resource when knowledge of the bottom sediments in the projected impact zone is available.

Four commercial lobstermen were contracted to fish experimental ventless traps at pre-defined randomly-selected stations throughout Massachusetts Bay. Traps were constructed of 1-inch wire mesh and were fished in six-pot trawls with alternating vented and non-vented traps. A total of forty trawls were deployed and hauled twice per month in October and November. Catch per trawl was chosen over catch per trap as the index of relative abundance because of the potential for the presence of one trap affecting the catch of the nearest trap.

A total of 936 trap hauls were sampled during sixteen sampling trips, from which 8,602 lobsters were observed (Figure IIIC.1). As expected catches were higher in the ventless traps and >90% of all lobsters caught were sub-legal. Vented traps captured a higher proportion of legal sized lobsters than did the ventless traps. Smaller lobsters (71-82mm CL) were observed more frequently in boulder and cobble habitat than in mud or sandy areas (Figure IIIC.2) and were more common in shallow water than deep strata (Figure IIIC.3).

Figure IIIC.1. Commercial lobster trap sampling during ventless trap survey.

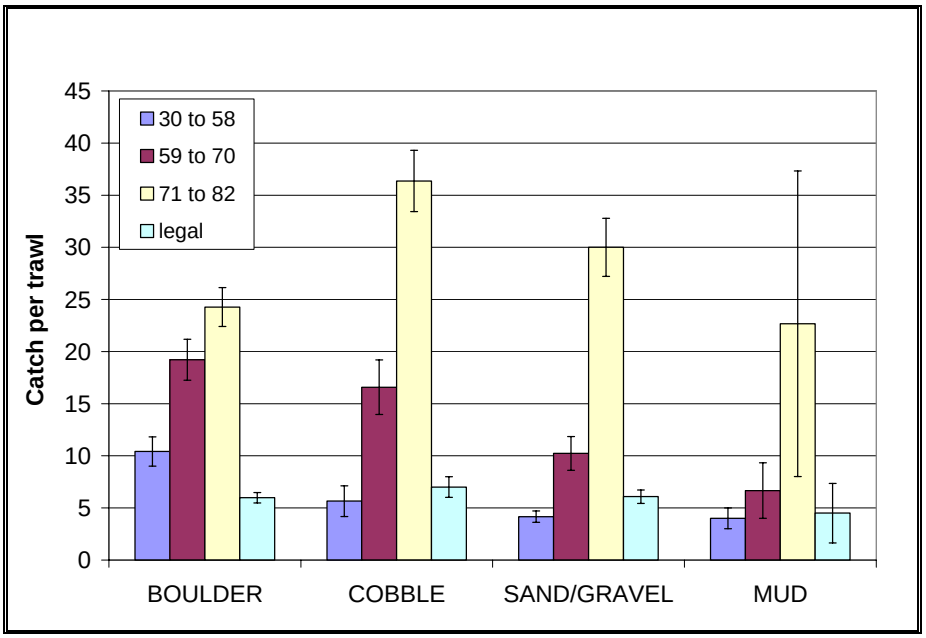


Figure IIIC.2. Catch per trawl of four size classes; juvenile (30 to 58mm), pre-recruit (59 to 70mm), recruit (71 to 82mm) and legal (> 83mm) of lobsters by sediment type.

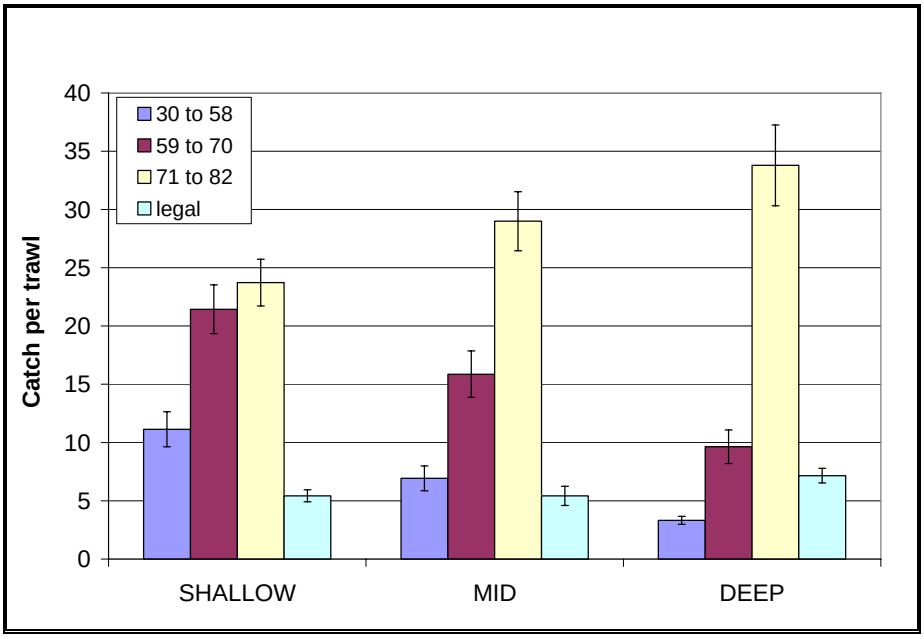


Figure IIIC.3. Catch per trawl of four size classes; juvenile (30 to 58mm), pre-recruit (59 to 70mm), recruit (71 to 82mm) and legal (> 83mm) of lobsters by depth strata; Shallow – (0 to 15 m), Mid – (16 to 30 m), Deep – (>30 m).

Despite the main goals of this survey and the limitations of a random design, we attempted to evaluate lobster abundance and size structure in the vicinity of the impacted HubLine pathway. Data were compared to non-impacted areas throughout Massachusetts Bay while taking into consideration the effects of depth and bottom sediment type. Analytical results are only preliminary since insufficient data were collected during this pilot effort to date. Also the random selection of stations minimized the number of stations in the immediate vicinity of the HubLine pathway, however, there were three stations that fell within 1000 feet of the back-filled trench. Traps at these sampling stations (Figure IIIC.4) were hauled a total of 4 times between October 1st and November 30th. Mean catch per trawl data from these three stations were compared to nearby control stations in the same strata type but outside of the impacted area (Table IIIC.1). Preliminary results do not appear to provide any discernable patterns in the catch rates of lobsters between sampling stations adjacent to and outside the HubLine pathway. It is highly likely that the 1000 ft. buffer zone is too broad to determine effects on lobster density from the construction-related sediment impacts. Differences observed in catch rates of lobsters may be due to differences in geographic location, sediment type, and depth.

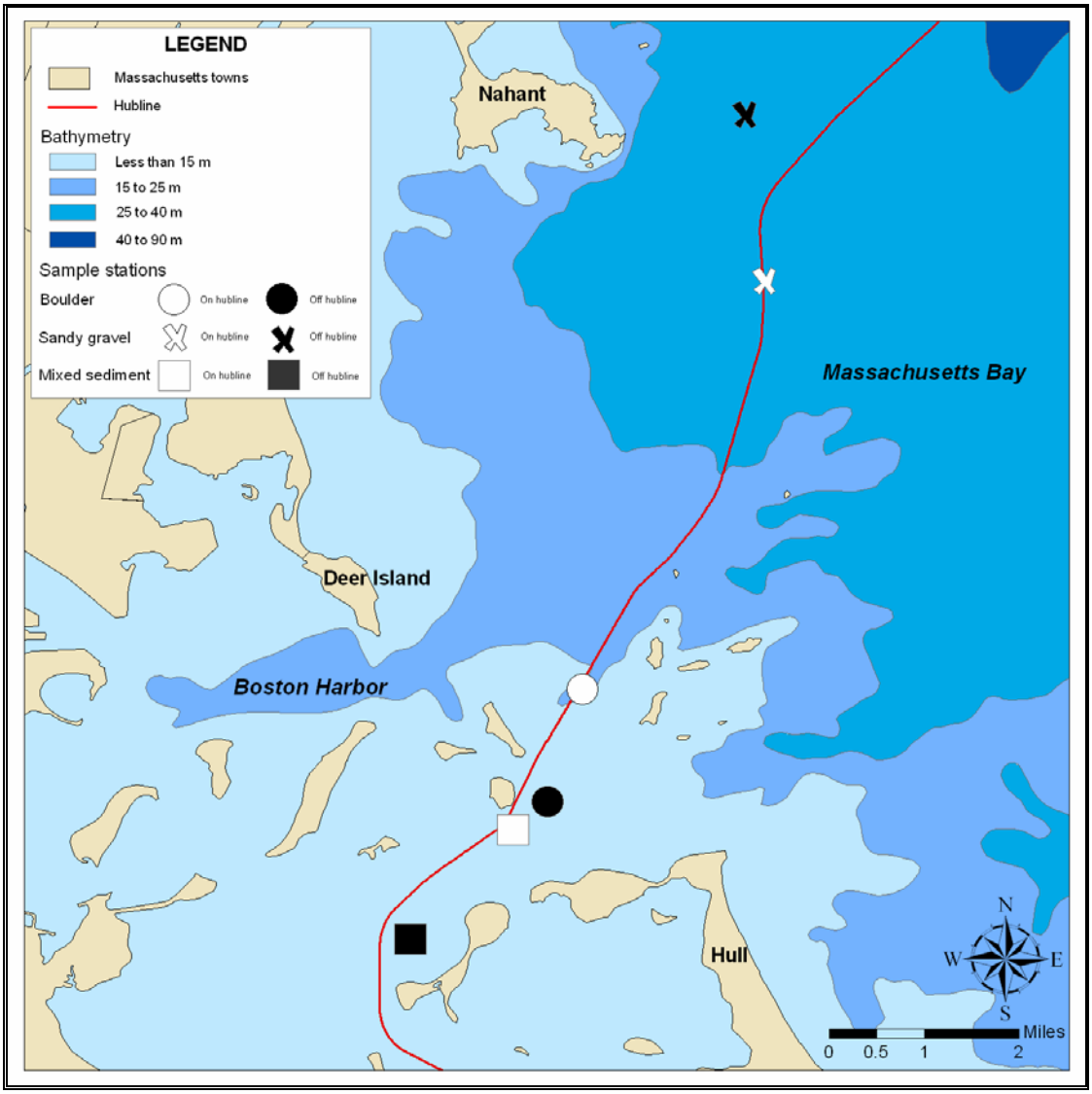


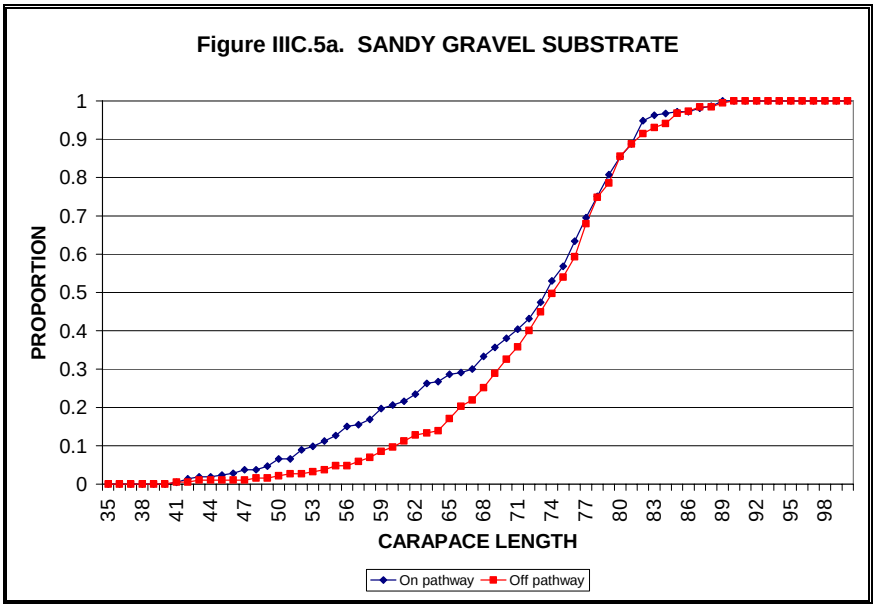
Figure IIIC.4. Map of Boston Harbor showing the HubLine pathway and three pair of sampling stations. Each shape represents a strata type; light colored shapes are considered on the HubLine (within 1000 feet) and dark shapes are off the HubLine (> 1000 feet).

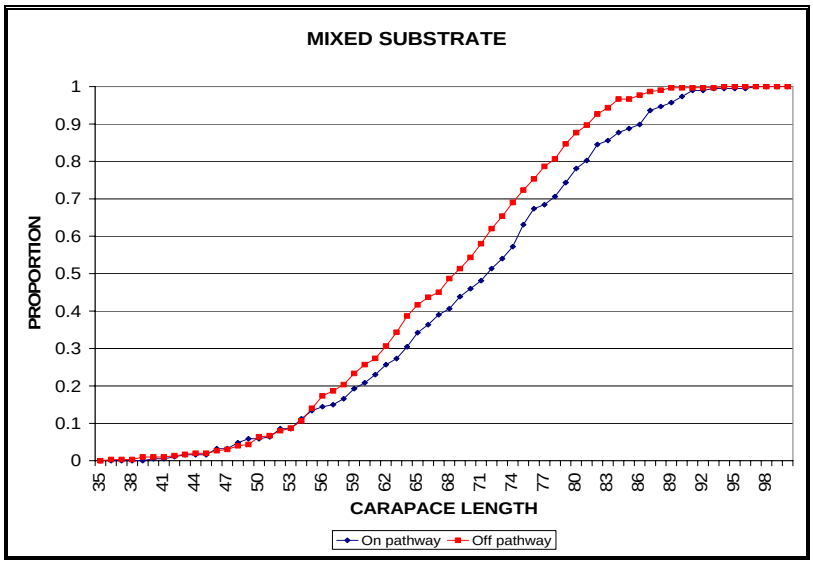
The trends in lobster catch rates by size category and egg bearing status by sediment type and trap type were consistent with trends observed throughout the study area. In general, the catch consisted mostly of sub-legal sized lobsters, with most of the catch retained in the non-vented traps. Few egg-bearing females were encountered and very little shell disease was observed (Table IIIC.1). The highest catch rates were observed on rock substrates, followed by mixed substrates, and sand/gravel substrates. As expected, this pattern suggests that lobster density is related to the surficial complexity of the substrate, with density of lobsters being highest in substrates with the greatest complexity, and density being lowest in substrates with the least complexity (Cobb 1995).

Table IIIC.1: Summary of the mean catch per trawl (± St. Dev.) in three pairs of stations. (A station located within 1000 feet of the HubLine pathway was considered on the HubLine, and was compared with a nearby station in the same strata located off the HubLine.)

	Sand/gravel substrate		Mixed substrate		Boulder substrate	
	On	Off	On	Off	On	Off
LEGAL	3.67 (2.31)	4 (2.94)	7.25 (2.87)	5.67 (4.16)	6.25 (1.71)	3 (2.94)
SUB-LEGAL	67.67 (4.16)	42.75 (14.24)	40 (14.58)	73.67 (12.06)	140.75 (16.21)	10 (12.08)
EGGERS	2 (2.65)	1 (0.82)	0.25 (0.5)	0.67 (1.15)	0.5 (1.0)	0.00
DISEASED	0.00	0.00	0.5 (0.58)	0.67 (0.58)	0.25 (0.5)	0.25 (0.5)
VENTED	3.33 (2.31)	6.25 (3.2)	9.25 (6.24)	5.33 (2.08)	13 (2.16)	2.75 (2.5)
NON-VENTED	68 (5.29)	40.5 (14.01)	38 (12.38)	74 (17.06)	134 (17.15)	10.25 (11.95)

An examination of the size distributions at each pair of stations reveals no clear trend (Figures IIIC.5a,b,c). The lobsters caught at the sandy gravel and boulder strata (Figure IIIC.5a and IIIC.5c) along the HubLine pathway were smaller than those caught off the HubLine pathway. However, in the mixed substrate strata (Figure IIIC.5b), this pattern is reversed, with smaller lobsters found away from the HubLine. The large difference in size distributions observed in the comparison of the two boulder substrate stations may in part be biased due to a very large difference in the number of lobsters caught (587 on the pathway, 52 off), and should be interpreted cautiously.





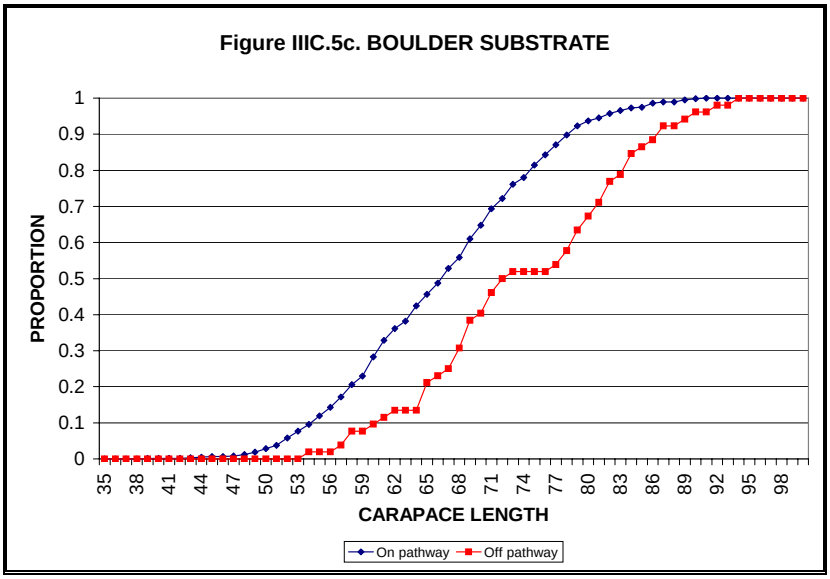


Figure IIIC.5a,b,c. Lobster cumulative size distribution at each of three pairs of Massachusetts Bay stations.

Data from our 2004 pilot study help demonstrate the relative importance of substrate type for American lobsters, and provide some insight on the relative abundance of lobsters in Massachusetts Bay in relation to depth and sediment type. However, these analyses should be viewed as preliminary given the limited number of observations made in this pilot effort. More robust analyses, including further HubLine-related comparisons, will be possible by winter 2005-2006 once a full season of sampling is completed.

Modifications to the study design during 2005 were made based on experience gained from the 2004 pilot study. Strata were re-defined such that a fully-defined strata now consists of at least 75% one sediment type. This provides more fully-defined strata from which to select stations and eliminates the ambiguous "mixed" category. There are now a total of 80 stations in Massachusetts Bay (Figure IIIC.6), and each

strata type is represented by at least 7 stations. Each station will be sampled using a six pot trawl, composed of alternating vented and non-vented traps, fished bi-monthly. The only deviation from the random station selection method is that we intentionally selected three additional locations to sample based on their proximity to the HubLine and to potential habitat enhancement sites.

Data collection for the 2005 season began in May. Comprehensive analysis of all data will be completed upon conclusion of the 2005 sampling season.

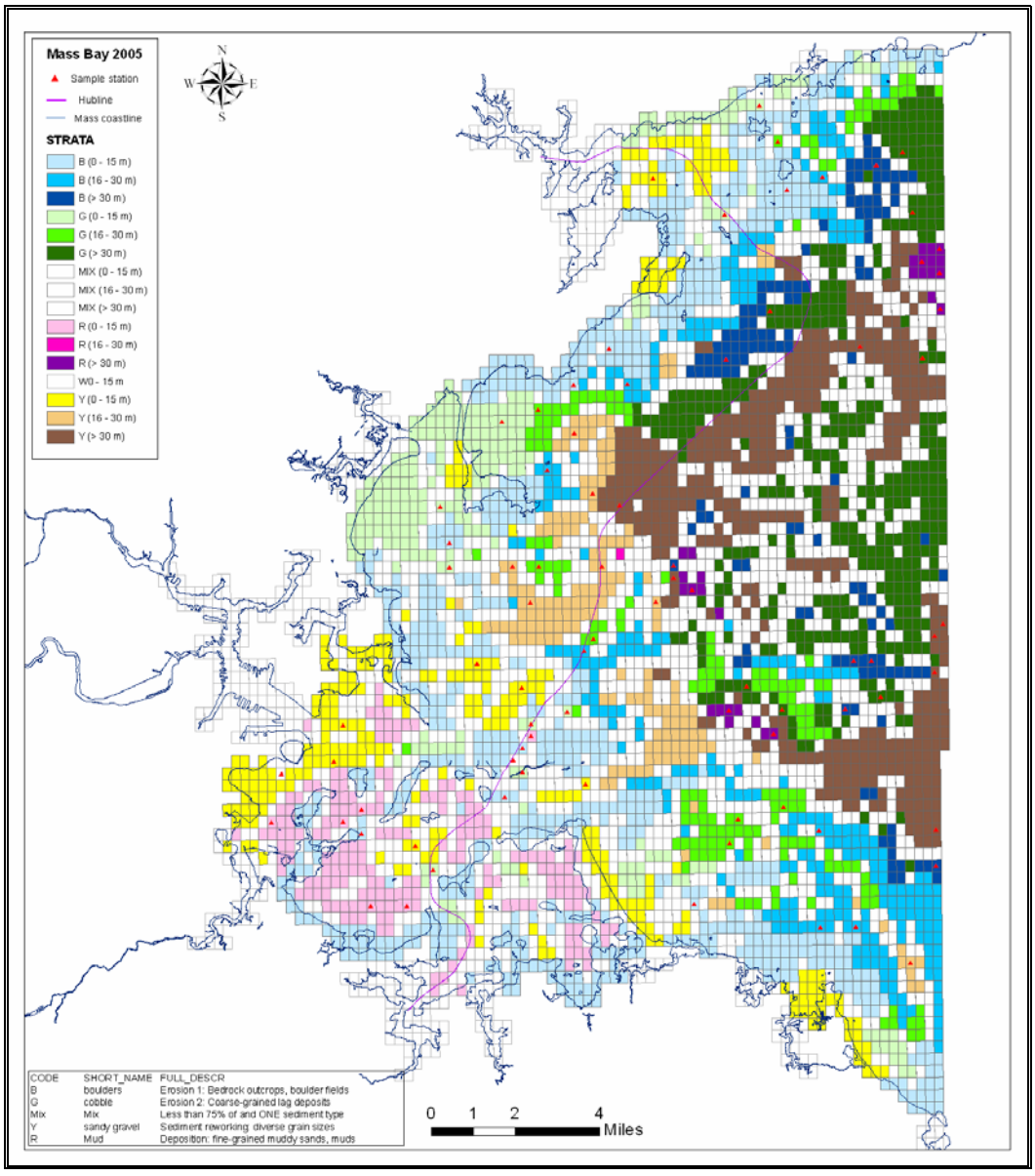


Figure IIIC.6. Map of Massachusetts Bay study area with 2005 sample stations and strata.

Literature Cited

Cobb, J. S. 1995. Interface of Ecology, Behavior, and Fisheries. In: *Biology of the Lobster (Homarus americanus).* I.R. Factor, ed. Academic Press, San Diego. Pp 139-151.

III D. Acoustic and Optical Surveys of Pipeline Pathway

The pipeline pathway recovery assessment, initiated during 2004 and reported in the FY-04 Progress Report, continued with ROV and sonar imaging conducted in August, October, and November 2004. Inshore, shallow water area segments (< 20 ft.), previously not surveyed due to the R/V Gloria Michelle's draft, were surveyed with a smaller contracted vessel. The work resulted in complete coverage of the back-filled trench across all depths. Sonar images were reviewed in order to evaluate sediment type and relief. Permanent sites were established for future monitoring. These sites are representative of various sediment types, topographical features, and depth along the pipeline pathway. Forty-six concrete moorings with tethered sonar reflectors (Figure IIID.1) were constructed and deployed at these sites to ensure accuracy in the re-surveying of these locations. Surveys of these sentinel sites began in June 2005.

Figure IIID.1. Buoyed sonar reflector which was tethered to concrete moorings at selected sites.

An amendment of the administrative consent order, water quality certification, and license was defined in November, 2004 for Algonquin Gas Transmission Company. Algonquin's permit requirement to restore impacted sediments to pre-construction quality was modified to allow some areas to remain intact to minimize impact to recolonized animals while other sites required improvements. Additional fill was placed at twelve sites between November 1, 2004 and February 15, 2005 by Algonquin's subcontractors. These new fill locations will be evaluated during 2005.

Literature Cited

Anonymous 2003. HubLine Pipeline Project Supplemental Monitoring Report, Lobster Assessment. Prepared for Duke Energy Gas Transmission (Algonquin Gas Transmission Company) by TRC Environmental Corporation and Normandeau Associates, Inc. November 2003, 23 pages.

Estrella, B. T. and D. J. McKiernan. 1989. Catch-per-unit-effort and biological parameters from the Massachusetts coastal lobster (Homarus americanus) resource: description and trends. NOAA Tech. Rep. NMFS 81. 21 p.

Wahle, R. A. 1993. Recruitment to American lobster populations along an estuarine gradient. Estuaries 16(4):731-738.